# S5 Physical Education Practice Paper (Set 1): Health-related Fitness, Exercise Physiology and Energy Systems, Training Principles and Periodisation, Biomechanics and Levers, Sport Participation and Olympic Economics, Injury Prevention and First Aid

**Senior Secondary Physical Education**

S5 PE paper Set 1: 24 parts, 100 marks, 60 min on BMI, WHR, 1RM, heart rate, energy systems, periodisation, biomechanics, injury rate, CPR.

## Question 1: Health-related Fitness

*Calculate each of the following and state the units.*

| # | Question |
|---|---|
| 1 | A S5 boy weighs 68 kg and is 1.72 m tall. Calculate his BMI (1 decimal place) and classify it using the Hong Kong Department of Health adult standard (18.5-22.9 normal, 23.0-24.9 overweight). |
| 2 | His waist is 84 cm and hip 96 cm. Calculate the waist-to-hip ratio (2 decimal places) and state whether the male WHR risk cut-off and the 90 cm waist cut-off are exceeded in this case. |
| 3 | He benches 60 kg for 8 repetitions. Using the Epley formula (1RM = load x (1 + reps / 30)), estimate his 1RM (1 decimal place). |
| 4 | He does 38 sit-ups in one minute against an age norm of 45. Calculate the gap in repetitions and the gap as a percentage of the target (1 decimal place), then suggest one muscular-endurance training measure. |

## Question 2: Exercise Physiology and Energy Systems

*Show all working and units.*

| # | Question |
|---|---|
| 5 | The boy is 17. Estimate maximum heart rate with 220 - age and calculate the 60%-80% target heart-rate range (whole numbers). |
| 6 | His resting heart rate is 62 bpm. Use the Karvonen (heart-rate reserve) method to find the heart rate at 70% intensity (whole number). |
| 7 | He weighs 70 kg and runs 100 m in 12 s. Calculate average speed (2 decimal places), the kinetic energy at the finish, and the average power (kinetic energy only, whole number). |
| 8 | He runs 10 km at about 1.0 kcal per kg per km. Calculate total energy cost; if 60% comes from fat, find the fat oxidised (9 kcal per gram, 1 decimal place). |

## Question 3: Training Principles and Periodisation

*Give 1 decimal place unless stated otherwise.*

| # | Question |
|---|---|
| **9** | He currently trains 3 x 8 at 50 kg. If the load rises 2.5% each week, what load applies after 4 weeks (1 decimal place)? |
| **10** | Calculate volume load (sets x reps x load) for the original 3 x 8 at 50 kg and for the new 3 x 8 at 55 kg, and find the percentage increase (1 decimal place). |
| **11** | A 52-week annual plan has 18 weeks general preparation, 12 weeks specific preparation, 14 weeks competition and 8 weeks transition. Check that the total is 52 weeks and calculate the competition phase as a percentage of the year (1 decimal place). |
| **12** | His resting heart rate rises from 58 to 68 bpm while heart-rate variability falls 12%. Calculate the percentage rise in resting heart rate (1 decimal place), identify the overtraining warning and state the adjustment needed. |

## Question 4: Biomechanics and Levers

*Take g = 9.81 m/s^2 and give 1 decimal place unless stated otherwise.*

| # | Question |
|---|---|
| **13** | A football leaves the foot at 20 m/s at 35 degrees (ignore air resistance). Calculate the horizontal range (1 decimal place) and the maximum height (2 decimal places). |
| **14** | A tendon applies 250 N at a moment arm of 0.28 m. Calculate the torque in N m (1 decimal place). |
| **15** | He squats 80 kg for 10 repetitions, raising his centre of mass 0.55 m each time, in 30 s. Calculate total work (1 decimal place) and average power (1 decimal place). |
| **16** | A lever has a load of 400 N at a load arm of 0.15 m and an effort arm of 0.45 m. Calculate the effort required (1 decimal place) and the mechanical advantage (1 decimal place), and name the lever class. |

## Question 5: Sport Participation, Olympics and Event Economics

*Give percentages to 1 decimal place.*

| # | Question |
|---|---|
| **17** | A survey of 1,200 citizens finds 456 exercise three or more times a week. Calculate the participation rate (1 decimal place) and the gap in percentage points from the 50% policy target. |
| **18** | A Games delegation has 46 athletes and wins 2 medals. Calculate athletes per medal (1 decimal place) and state one limitation of the indicator. |
| **19** | An event costs 3.2 hundred million; tickets 1.1, sponsorship 0.9 and tourism 0.7. Calculate total revenue, net position and the cost-recovery ratio (1 decimal place). |
| **20** | An event needs 600 volunteers over 3 days, 2 shifts a day of 6 hours each. Calculate total service hours and the average per volunteer (1 decimal place). |

## Question 6: Injury Prevention and First Aid

*Show working; percentages to 1 decimal place.*

| # | Question |
|---|---|
| **21** | An event reports 4.2 injuries per 1,000 exposure hours. A squad of 24 trains 6 hours a week for 12 weeks. Calculate total exposure hours and the expected number of injuries (2 decimal places). |
| **22** | For an acute sprain, RICE applies for the first 48 hours with 15-20 minutes of ice every 2 hours. Calculate the maximum number of ice applications in the first 48 hours and give the four RICE steps. |
| **23** | Before exercise he weighs 70.0 kg and after 68.4 kg, having drunk 0.6 L (about 0.6 kg). Calculate the true fluid loss (1 decimal place) and its percentage, and judge whether it has reached the performance-impairing level (above 2%). |
| **24** | Adult CPR compresses at 100-120 per minute with a 30:2 ratio. Calculate the number of compressions in 2 minutes (whole numbers) and the approximate number of 30:2 cycles (1 decimal place). |

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